GIPSA PEER REVIEW OF "CAPTIVE SUPPLIES AND SPOT MARKET PRICES FOR FED CATTLE IN THE TEXAS PANHANDLE"
by
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1. BACKGROUND, MOTIVATION, AND SPECIFIC OBJECTIVES

Concentration, structural change, market performance, and the use of complex formula and value-based marketing systems by packers raised questions and concerns from livestock producers. Concentration ratios for the top firms slaughtering fed cattle rose sharply to a high of 82 percent in 1994. As the industry continues a rapid move toward value-based methods of pricing, the complexity of procurement and pricing methods may increase. As part of its mandate, USDA would be interested in whether such change comes with increased opportunity for packers to engage in unfair, unjustly discriminatory, or deceptive practices to the determent of livestock producers.

USDA recognizes that the role of non-cash[2] purchases in the price determination process is subject to considerable debate in the industry and in the agricultural economics profession. Non-cash purchases are often referred to as captive supplies, including forward contracts, marketing agreements/formula purchases, and packer-fed cattle. A key question in the debate is whether packer's use of non-cash procurement methods has the effect of depressing cash prices paid for livestock.

One of the Grain Inspection, Packers and Stockyards Administration's (GIPSA), USDA, major responsibilities under the Packers and Stockyards Act is to ensure open, competitive market conditions for livestock and meat. This responsibility led to the recommendation for increased monitoring and enforcement of the antitrust and regulatory policy activities of the agency. GIPSA announced that it was implementing a major reorganization of its Packers and Stockyards program to strengthen its effectiveness in addressing competitiveness issues, and that USDA has requested additional funding to examine industry structure and competition in the livestock, meat, and poultry industries (undated GIPSA Backgrounder release). To address other industry concerns, USDA has decided to conduct outside peer reviews of some of the major investigations of competitive behavior in the industry. The peer reviews are meant to enhance GIPSAs investigative capabilities and to obtain constructive suggestions that could improve its programs further. The studies examined in this review are part of these activities.

2. CHARGE TO THE REVIEWERS

Reviewers were asked to: analyze the quality of the output and associated analyses to determine if appropriate methods and procedures were employed; assess whether GIPSA asked the right questions, and used appropriate analytical models to answer critical questions; and make suggestions and recommendations about additional analyses, data, or questions that may strengthen the investigation being reviewed or enhance the ability to investigate these critical

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[2] The terms "cash" and "spot" are used interchangeably herein, as are the terms "non-cash" and "non-spot."

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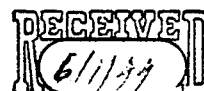
questions. By GIPSA request, this reviewer provides an assessments of findings and recommendations that is independent of the other reviewers'. It is not a consensus report.

3. THE STUDIES

GIPSAs Ft. Worth field office conducted preliminary investigations of fed cattle procurement in the Texas panhandle. GIPSA conducted in-depth interviews with feedlot operators and collected proprietary, confidential data related to procurement activities of four steer and heifer slaughter plants in the Texas panhandle, which are operated by the three largest U.S. packing firms. Transactions were collected from each plant. Over 37,000 transactions representing over six million head of steers and heifers for a 16-month period (kill dates 2/6/95 to 5/18/96) were collected. Information on the specific terms of marketing agreements and formula sales was also collected. GIPSA staff summarized the interviews and produced basic graphics and summary data from the transaction data.

Because modeling the complex interrelationships among factors that determine prices paid for cattle was beyond the scope of GIPSA staff responsibilities, econometric analysis was desired in an effort to develop and base conclusions about the potential effects of various procurement practices on prices. One specific objective was to measure the use and effect of noncash purchases on prices paid for fed cattle during the period of investigation. GIPSA desired findings useful in policy decisions and, where warranted, for developing possible rulemaking or litigation.

GIPSA obtained cooperative research assistance from faculty at the University of Nebraska and Iowa State University. The cooperative project was to conduct statistical analysis and econometric analysis with an aim to (1) identify and quantify relationships between non-cash purchases of cattle and cash prices and (2) conduct extensive statistical diagnostic tests on the statistical relationships developed under (1). The report submitted by John R. Schroeter of Iowa State University and Azzeddine Azzam of the University of Nebraska-Lincoln. to the Grain Inspection, Packers and Stockyards Administration was the result of the cooperative work and along with GIPSAs preliminary data analysis is the focus of this review.

4. GIPSA INVESTIGATIVE WORK

GIPSA personnel are to be commended for their in-depth round of informative interviews. Several ideas discussed in the interviews are worth highlighting. The focal concept is the feedlot reporters' perception that buyers have or may have the ability to impact prices through selective bidding strategies or through some form of futures price intervention. This perception is important and adds to the justification for the GISPA review. Thus, the questions posed for the econometric study that is the focus of this review are important and justified. On the other hand, one needs to appropriately weight the perceptions because commodity sellers may be predisposed to the view that buyers and others can make better use of or have more information to use "against" them (e.g. Jones, et al pp. 187, 190, and 192).

Two other details are found in the interviews. First, most auctions have few bidders and the bid prices from all bidders are "typically" equal. Second, once livestock are on a show list, they do not go to a formula sale. The later point is important in that it eliminates one possible method of price manipulation. It also raises a question about a shift in the quality composition of the lots available for spot sale. When captive use increases, does it remove the better lots, resulting in lower spot prices on the remaining lots? The first point is important in that spot price manipulation would take more effort if all bids were equal. How can an individual buyer meet spot purchasing needs by underbidding? Does low bidding bring all bidders down on lots or does

the buyer selectively bid on lots with a lower expected price? Thus, finding the cases where bids are not equal may help point out potential pricing strategies related to formula pricing.

5. DATA SET DEVELOPMENT

GIPSA personnel were successful in collecting a detailed and large data set for economic analysis. The number of observed transactions in the data set is certainly large enough for the type of regression modeling that was done in the study. GISPA staff should evaluate the time frame of the data to determine whether problematic pricing strategies would be fairly represented during the part-year time frame of the data collection. The question here is -- are attempts to strategically bid in the spot market more likely to appear outside the time frame of the data collection effort or are they equally likely at all times of the year?

When users of statistical data are interested in relationships and causal connections to help formulate policy choices, adequate specification and interpretation of error in the models is important. Typically, the objective of modeling involves the linkage of response variables, Y, with explanatory variables, X, through a statistical model in an attempt to represent an underlying phenomenon. While many modeling efforts appropriately examine the error components of the model, e.g. regression error component, measurement error is often overlooked. Here measurement error arises in the inability to accurately or directly measure Y and X. The data observed, Y^* and X^*, having various causes for differing from the theoretically desired Y and X. At times, the measurement errors, Y^*-Y and X^*-X, can have serious impacts on the models. This section examines some potential sources of measurement error in the data used in modeling.

One issue is data censoring. GISPA did not collect data for lots of fewer than 35 head. What proportion of slaughter do these transactions represent? Since smaller lots may realize lower prices (Figure 6), what impact can the volume and weekly distribution of such purchases have on AMS price reports? Do smaller lots have an impact in weeks where buyers need fewer spot purchase head to meet needs? About 25 percent of the feedlots have about 80 percent of the sales. Do the smaller lots have disproportionate sales during weeks with price aberrations?

Another issue is data editing. GISPA staff also did some editing of data and removal of problematic cases. It appears that range edits were used. One problem with range edits is that while erroneous extreme values are found, erroneous central data are not? The relationships found in the modeling are small price differences and may be influenced by a few occasions of suspect purchasing. Small errors in prices in the middle of the range may be enough to influence model fit in such a case. An analysis of residuals can help determine if this is a problem and should be included in the analysis.

Edited data should be flagged to observe their fit in the model. Can the edited or removed data be more likely to be associated with problem prices? A review of the residuals to the model fit for these data points would help in this determination. Since editing very large or small values may be related to pricing issues in the study, a multivariate approach to editing rather than range editing might be better. For example, since bidders tend to give identical bids for a lot, one might expect similar, say lots of a similar percent by type on a given day, to have similar prices. But rather than changing the value, a better approach may be to flag it as it might be related to the pricing structures of interest.

Decisions regarding the purchase date variable for contract cattle when it is missing may influence model fit. While contract cattle are a small percentage of slaughter and the coded value

seems reasonable, the timing of contract cattle use varies considerably (Figure 7) and may be related to pricing issues.

Data coding can impact model fit. For example, the "cattle type" field is a coded value based on exceeding a percentage of a cattle type (70 or 80 percent steers to be coded as steers). Such coding may diminish the model's predictive ability. Typically, cattle type was found to influence price paid. In the econometric models, cattle type was incorporated by adding "dummy variables" (1 or 0) based on the coding as a heifer lot or not, or as a mixed lot or not. In all cases, as might be anticipated, these dummy variables were highly significant with coefficients indicating that they reduce price. Thus, one might expect a meaningful price difference for a steer lot of say 45 percent steers versus one with 65 percent steers. Even 5 percent differences in the Steer coded lots might make for meaningful price differences relative to the level of effect found in the modeling. Coding adds a form of measurement error to the variable and measurement error impacts ordinary least squares regression methods. In future analyses, consider using the actual percentages of each type in the lot rather than coding to a multinomial response variable.

6. GRAPHICS PRESENTED

This section focuses on the graphics used in the presentation to the National Cattleman's Beef Association. The discusion has general comments on graphical methods along with some ideas on other graphics of possible use.

Bar chart graphics should include an indication of the variance of the bars. For example, Figure 2, as a box plot with the range shown would be preferred since Figure 7 indicates that, over time, there is considerable variation in purchases by day. The slaughter graphic should have range indicated as well. Also, a time series of the slaughter by day would be helpful, especially since not slaughtering on holidays or on a Saturday influences buying needs.

Scales should be comparable. Figure 3 is an example where it is difficult to compare procurement with inventory because the date range differs and the number of days in each tick-mark interval differs between the charts. In creating daily charts it is useful to divide the chart into meaningful periods. In this case, showing the weeks would help. For example see Figure 7 where I have drawn in a vertical shaded bar on each Monday. (Note that there is something unusual about the sizes of the intervals. The first having 6 days and the second having 7. Why is this?)

In Figures 4 and 5 the titles indicate that different prices are graphed, yet the price series on the graphs are all identical. Figure 6 has some of the most important information. Because the variables compared vary more over time than at a given time, critical information is lost to the eye. I would suggest making companion charts plotting the ratio of the compared items over time. In the ratio charts (Figure 6), the large differences shown by the arrows would be more obvious and any patterns of differences would be visible.

Figure 7 shows that the purchasing patterns by day of the week are quite variable over time. In some weeks most purchasing is done on Monday, some weeks it is Wednesday, and at times it is roughly equal volume from Monday thru Thursday. Are the patterns worth building into modeling efforts? How are these purchase variations related to the number of days between purchase and slaughter?

A chart of Average-days-out may be helpful. If there is variation in this value over time, it should be considered in the modeling efforts because packer control of both purchase and delivery would be most useful in attempts to influence spot prices.

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Figures 4 and 5 are important in that they indicate that the AMS price data do not always match packers purchase data. Figure 6 "Average Live Prices" also exhibits the differences. GISPA should examine the methodology used by AMS to construct the "average" price. Often, agencies try to make the time series of such prices robust to influential outliers by truncating or deleting extreme prices. A contact in a call to the AMS Amarillo office stated that they do not do such data elimination, but that it is known that feeders do not report all sales, especially extreme ones. Extreme sales include high and low price sales as well as special arrangements such as delivery agreement for much later than the industry standard of 7 days. (Can these agreements play a role in the supply side of the models?) The deviations found in Figures 4 and 5 would occur in such "censored" reporting. The extreme prices in a given week may be the most important data for determining spot pricing problems. Further, the use of a "censored" average value in a payment formula may result in some bias in the payment, especially in weeks where there are many "censored" values in the AMS report. During some weeks up to 10 percent of the sales seem to be withheld from reporting. The AMS contact believed that withheld reports "averages" about 1 or 2 percent, so an occasional 10 percent is not impossible. The times of extreme censoring may be related to or provide clues to pricing strategies.

The models should look for pricing problems in two directions. If a bias exists for these activities, it could be in favor of the seller using AMS as a base price in that the low spot prices may be dropped from the AMS calculation, thus voiding attempts to manipulate the price! On the other hand, in times when high prices are warranted, their removal would reduce the average price used in the formula.

7. GENERAL FOCUS OF THE REVIEW OF THE STATISTICAL MODELING

This section comments on the report by Schroeter and Azzam (1998). The authors provide a wealth of information related to the evaluation of a number of candidate models for the structure of spot prices. In general the authors' finding that the models do not conclusively provide evidence of packers' attempts to influence spot prices in an effort to gain an advantage in the formula based payments is correct. Likewise, the cautionary note that the analysis does not remove all suspicion is warranted.

The objective of their work, as stated in the statement of work, was "to measure the use and effects of noncash purchases on prices paid for fed cattle during the period of the investigation." These comments assess the extent to which the statistical methods and the presentation of such content in the report by the cooperators meets this objective.

GIPSA staff also reviewed the cooperative agreement results. I have grouped their questions and concerns into three topic areas for inclusion in the discussion in this review:

1. **USE OF MODELS** - Has the fundamental question, whether noncash purchases have an effect on prices paid for fed cattle, been answered? Can it be answered? How do we know if the models are correctly specified?

2. **THE DATA** - Better identification and definitions for the data included in the various analyses, including identifying data included and excluded.

3. **STATISTICAL METHODOLOGY** - Clarification of methodological questions about the choice of statistical significance levels, choice of one versus two-tailed tests, selective

presentation of results of tests for serial correlation for equations, and other diagnostic tests that were performed but not presented.

8. USE OF MODELS

This section addresses the fundamental question of whether noncash purchases have an effect on prices paid for fed cattle. Two aspects must be considered. First, how do we know if the models are correctly specified? Second, do the models provide answers to he fundamental question?

8.1 WHAT IS THE EMPIRICAL RELATIONSHIP BETWEEN CAPTIVE SUPPLIES AND SPOT MARKET PRICES?

GIPSA staff correctly points out that the supply of cattle, both non-spot and spot, is important in the analysis. If the supply of spot cattle is relatively low, then "conservative" bidding may not serve to fulfil the packer's slaughter needs. One model, see table VII.2.1 of the report, includes a proxy for feedlot inventory (variables lpl and lcpl). The variables are significant in the regression. But how important are they? And are there any nonlinear tendencies as feedlot capacity is reached or when feedlot inventory is low, especially when purchasing volume is in contrast to the level of inventory? Do the assumed error terms in the model hold at these extremes?

GIPSA is correct in stating that further development and motivation of the empirical equation is needed. For example, aggregating all sources of non-cash cattle into the single variable RATIO may be too crude a proxy for the supply type interactions. Volume may also be important.

The analysis using the ratio variable appropriately corrects for price differences over time using AMSPRICE. Thus, the model is used to examine price impact relative to regional average price. It may be better to examine impact relative to the other bidder purchases in the same time period. One could create indices to measure the correlation of use of captive supplies in a week among the buyers. A bid price consistency index could also be considered. Finally, the relationship between the captive use index and the bid price index may be worth examining.

The various models were informative. Still, the differences in prices paid by different firms and spatial competition aspects need explanation.

8.2 WHAT ECONOMIC MECHANISMS COULD BE BEHIND THE EMPIRICAL RELATHIONSHIPS?

An "abundance: of bidders (p.24: Last full ¶) in this region is, for the most part, three. GIPSA reviewers asked if different prices are expected when there are three bidders as opposed to a "dearth" of one or two bidders. Interviews indicated that, typically, all bids on a lot are the same. Any impact if and when bids differ may be the important consideration.

GIPSA is most concerned what drives the assumed bidding behavior (p. 25). How does the commitment of non-cash cattle affect the marginal value of additional cattle to the packer? Observed prices are the result of decisions by both buyers and sellers. Feedlots have the option, in theory but maybe not in practice in this small market, of seeking more bids, or withholding cattle for future sale if bids received are below their reservation prices. How do feedlot decisions affect the argument? Would decisions to withhold cattle in a given week or to try to keep prices down that week change the supply and price in opposite directions in subsequent weeks?

How much a part does a "for the mutual good" relationship play in negotiations? That is, packers need to keep the feedlots producing and feedlots need to keep the packers working . How can that be modeled? Do both sides compromise to maintain a relatively stable and predictable market?

GIPSA raises the issue of relationships between price between weeks, questioning the study Hypothesis 4 on p. 36. They provide an alternative hypothesis 4 as seeming equally plausible. Given the role of grading spread in determining the price of formula cattle, the spread is reduced when the average quality of the base carcass is higher relative to the average quality of formula cattle. Results for the equations shown in Tables VI.1.1, VI.2.1, and Table VIII.1 suggest that spot prices do not fully reflect the value of quality differences. Thus, it may be possible for a packer to purchase higher quality cattle selectively on the spot market without paying a commensurately higher price. Higher quality spot cattle would result in lower grading spreads for formula cattle, and perhaps result in lower overall cost to the packer for the quality of cattle slaughtered. Therefore, a packer may have a tendency to pay relatively high spot prices in a week preceding a week in which a relatively large volume of marketing agreement cattle is delivered. This issue is worth further study because there is a fixed supply available during any narrow window.

Note that in the last paragraph of section VII.1, RATIO's coefficient reflects the average effect on individual lot transactions, all else fixed. We need to know more about the correlation of RATIO values among the bidders. Do all their levels of captive supply usage vary together over time? If yes, is that to be expected in a fair market? If no, do the deviations deviate from what would be expected in a random process?

The discussion on the bottom of page 28 is important. Capacity limits of the feedlot are mentioned as a factor but omitted from the analysis. Likewise, packer capacity must be considered. The error structure in the model may not meet the independent and identically distributed assumptions of some of the models because the error structure could be influenced as either the capacity limit or uneconomic underutilization of the feedlot is approached. Interestingly, the packer may have more knowledge about feedlot inventory than the feedlot has about packer needs to meet work or delivery schedules. Given the delivery and scheduling process, the feedlot knows something about captive deliveries in the fourth week of the month, although possibly only from that operation. Does that influence spot prices?

8.3 DOES THE FORMULA BASE PRICE INFLUENCE SPOT MARKET PRICING CONDUCT?

GIPSA is concerned (p.35: ¶1) that the relationship between packers' decisions and USDA reported prices seems to be too easily dismissed by the authors. GIPSA questions this seemingly based on a sense of completeness of the data, stating: "The three packers in the investigation represent , for the most part, the purchases that are reported in USDA's Texas Panhandle and Western Oklahoma feedlot report. The key question is whether the use of non-cash cattle affects spot prices, and these are the prices that would be reported to and by USDA." This section addresses this issue.

In the context of this investigation, we must distinguish causation from association. Here a causal relationship is one in which an outcome is produced by the manipulation of inputs or creation of circumstances or conditions productive of a desired outcome. Understanding the cause of price change phenomena is important in determining potential improprieties and in developing potential policies related to any such actions. Marini and Singer state that "an understanding of the meaning of causality gives rise to a diversified and flexible research approach, in which subject-matter considerations dictate the kind of evidence that should be sought to establish a basis for causal inference. Often the evidence is observational rather than experimental and is accumulated across multiple studies in multiple settings. Regardless of the research approach

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taken, the degree of belief in a causal hypothesis depends on the strength of the evidence available to support it." They argue that causal relationships are triggered by empirical clues (including covariation and temporal plausibility) and inductive reasoning, and consider the process of developing a body of evidence leading to a confirmation of a causal hypothesis. "This process involves demonstrating that an association cannot be attributed to an alternative explanation, and that there is an identifiable mechanism by which the cause produces the effect." An important aspect of he process is the consideration of the temporal sequence of the behavioral intentions and how they are modeled.

In assembling a body of evidence to support a causal hypothesis, there are no hard or fast rules of evidence. Nor can the decision about causality be made with absolute certainty. Decisions have varying degrees of confidence depending on the supporting evidence. In this regard, an important factor is the consistency that is demonstrated in the replications of and the variety of approaches taken in studies. Further, one must rule out alternatives to the causal hypothesis.

Prior studies used similar methodology to that of the cooperative research. Results were often similar, but not always finding a statistically significant negative relationship in the use of captive supplies and price. (One should examine the power of the not-statistically-significant studies to be sure they had sufficient sample size to find the level of difference found in the cooperative report, if it existed.) Thus, the information provided in the material subject to this review, while certainly showing an association, are not enough to be conclusive in determining improper price behavior.

9. THE DATA

GIPSA comments focused on better identification and definitions for the data included in the various analyses, including identifying data included and excluded. As noted by GIPSA reviewers (12-21-98 comments), assumptions 2 is critical. The "information presented in Appendix B [Figure 9 here] supports the assumption that 'the number of marketing agreement cattle to be delivered by a feeder within any one week is normally determined at least one week in advance of delivery.' Appendix B supports a typical advance notice of *at least two weeks* in advance of delivery." Conceptually, the analysis and interpretation is affected by the assumption of at least one week advance notice versus at least two weeks. The scheduling "variables" may not be sufficient to characterize the pricing process.

Day of the week was "not significant" in modeling (Table VIII.1). Other representations of the day-of-the-week concept should be explored. Typically, 90 percent of the week's spot purchases are made on one day during the week. Is there anything "different" about weeks that are not "typical" in this way?

Information in Tables VI.1.1 and VI.2.1 leads to some possible model issues. Plant and day-of-week are used as dummy variables, one in each model. Some, but not all, plants and days are significant. This leads to questions about covariation. How should the volume of Saturday slaughter be incorporated in the model? Does this volume interact with feedlot inventory? Are there interaction terms between plant and day of the week that are informative about pricing strategies?

Month was found to be statistically significant in the model. This raises the question about using week rather than month. The kill week dummy variable serves some of this purpose. The kill week variables are significant, but analysis of residuals for plant prices, Table VIII.2, leads the authors to state that the results do not support a claim that packers try to manipulate formula based price with spot purchases. While this is true of this specific attempt to model the structure,

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other models may be more useful. For example, a measure of price variability within week may provide clues on pricing strategies.

10. STATISTICAL METHODOLOGY

GIPSA asks for clarification of methodological questions about the choice of statistical significance levels, choice of one versus two-tailed tests, selective presentation of results of tests for serial correlation for equations, and other diagnostic tests that were performed but not presented. Such information is necessary, especially building diagnostics. For example, plots of the regressors against each other help us understand multicollinearity. Identification of influential outliers and residual analysis in general may uncover some of the structure in bidding. Such diagnostic work also helps assure that basic model assumptions such as constant variance, normality assumptions, and uncorrelated errors hold.

Since it is difficult to make direct comparisons of regression coefficients when the ranges of the regressors vary considerably, scaling the units of measurement is often recommended. While such "standardizing" of the regression coefficients removes this range problem from interpretation of the "importance" of individual regression coefficients, care must be used in that these remain partial regression coefficients and are dependant on the adequacy of the model (other variables chosen for the model and the particular range of the values in the data set being studied).

11. FINDINGS AND RECOMMENDATIONS

While the conclusion of no proven causation is correct, there needs to be analysis related to the discussion about expected low prices resulting in increased delivery of captive supplies. If this is true, and buyers were equally adept at "forecasting" spot price, then there should be a correlation among the buyers in their proportion captive use over time. A graphic time series of plant use rather than Tables V.1 and V.2 is a simple start. In such use of table V.2 data, a test for serial correlation would be useful.

The conclusion that the agency not use negative correlation as evidence of intent by purchasers to depress spot prices is essentially correct in that it is insufficient "proof." The agency may want to explore other models and analyses, which may be useful in understanding the nature of the negative correlation. Suggested analyses include modeling as a stochastic process or with path analysis or structural equation methods. Rather than using dummy variables for firms, consider multivariate or hierarchical regression methods and canonical correlation analysis. Use CART or neural network methods to find patterns in the data and to better create new variables. For example, rather than an arbitrary cut-off of 10,000 head for the over/under definition for small versus large, drawing on the Parato Principle that a few firms tend to do most of the economic activity, more distinct places to make the cut may be observable in the data.

In general, the econometric work in the paper lays important groundwork, but a more comprehensive model seems feasible and potentially useful for GIPSA needs. A more diverse statistical approach to developing the model is needed.
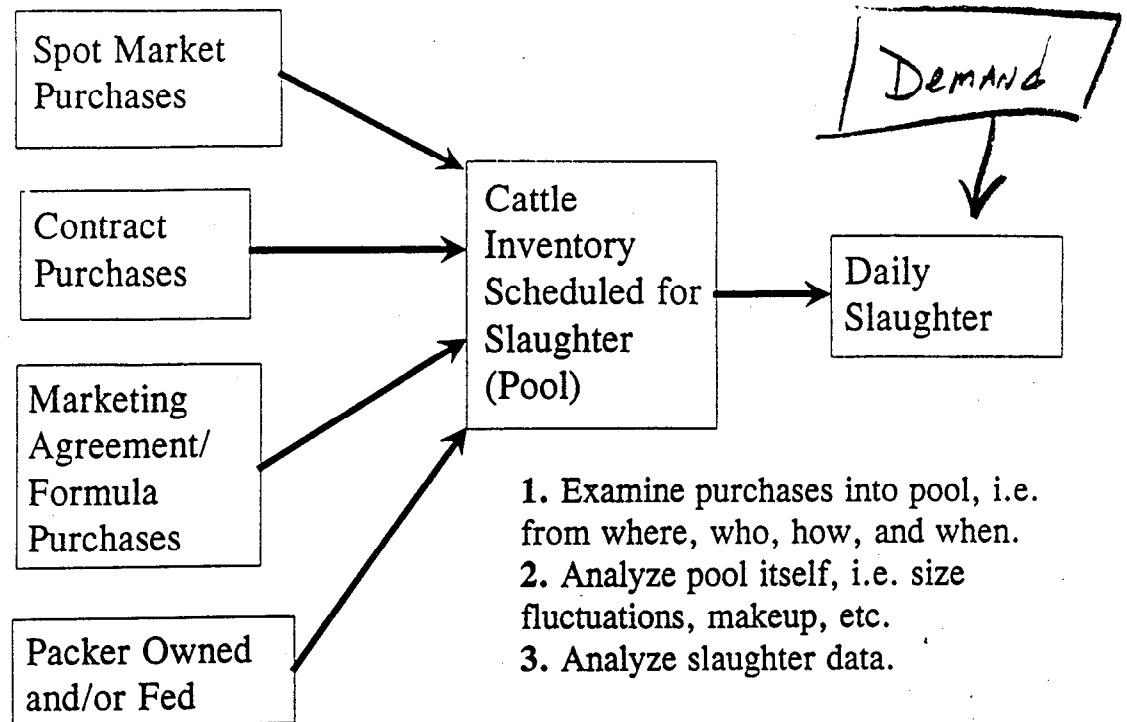
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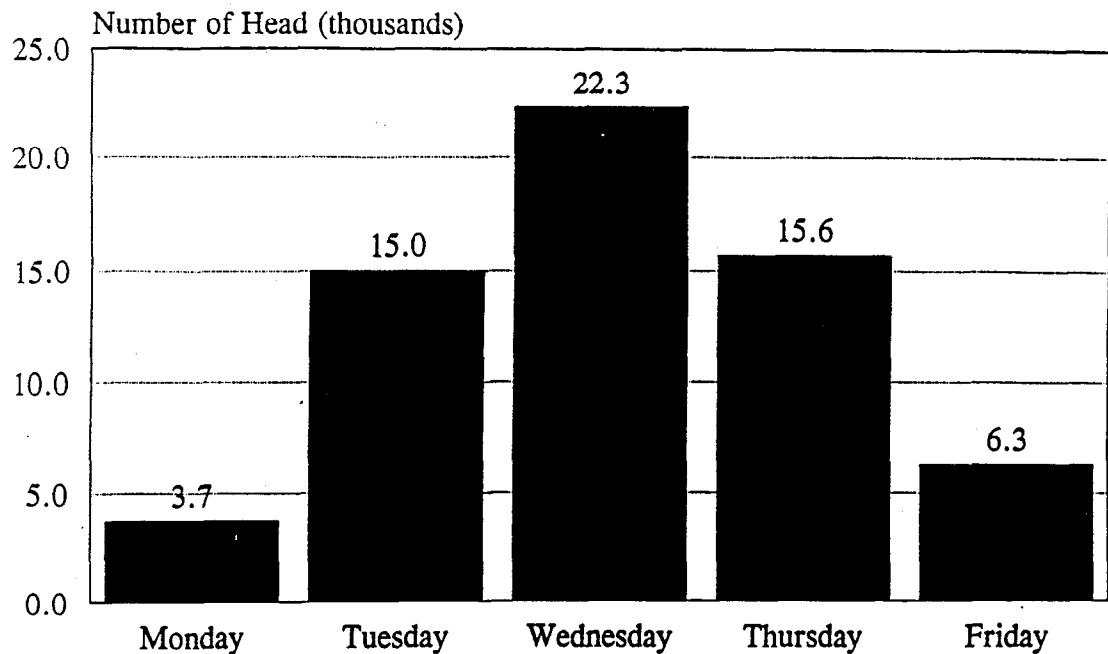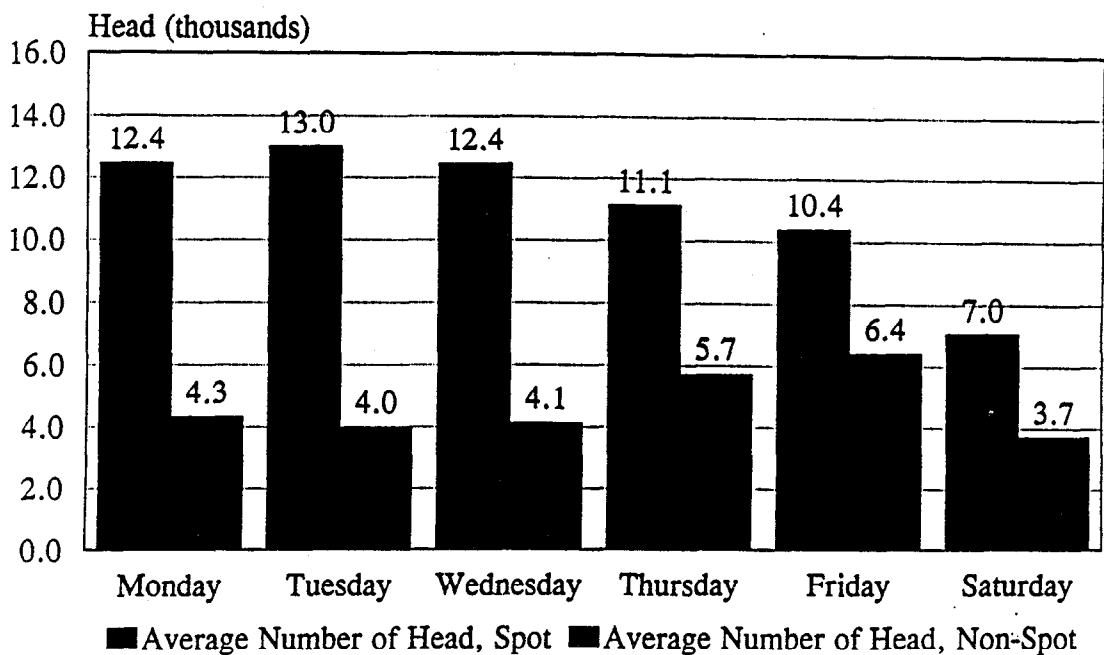
FIGURE 1

Fed Cattle Procurement and Slaughter Sequence

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┌──────────────┐
│ Spot Market  │ ──────┐
│ Purchases    │       │
└──────────────┘       │
                       ▼
┌──────────────┐    ┌──────────────┐        ┌──────────────┐  Demand
│ Contract     │ ─► │ Cattle       │ ─────► │ Daily        │ ◄──
│ Purchases    │    │ Inventory    │        │ Slaughter    │
└──────────────┘    │ Scheduled for│        └──────────────┘
                    │ Slaughter    │
┌──────────────┐    │ (Pool)       │
│ Marketing    │ ─► └──────────────┘
│ Agreement/   │
│ Formula      │
│ Purchases    │
└──────────────┘

┌──────────────┐
│ Packer Owned │ ──────┘
│ and/or Fed   │
└──────────────┘
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1. Examine purchases into pool, i.e. from where, who, how, and when.
2. Analyze pool itself, i.e. size fluctuations, makeup, etc.
3. Analyze slaughter data.

Procurement Method Summary

Bar chart. Y-axis: Percent, 0.0 to 100.0.
- Spot: 70.2
- Market Agreement: 21.0
- Contract/Packer Fed: 8.8

FIGURE 2
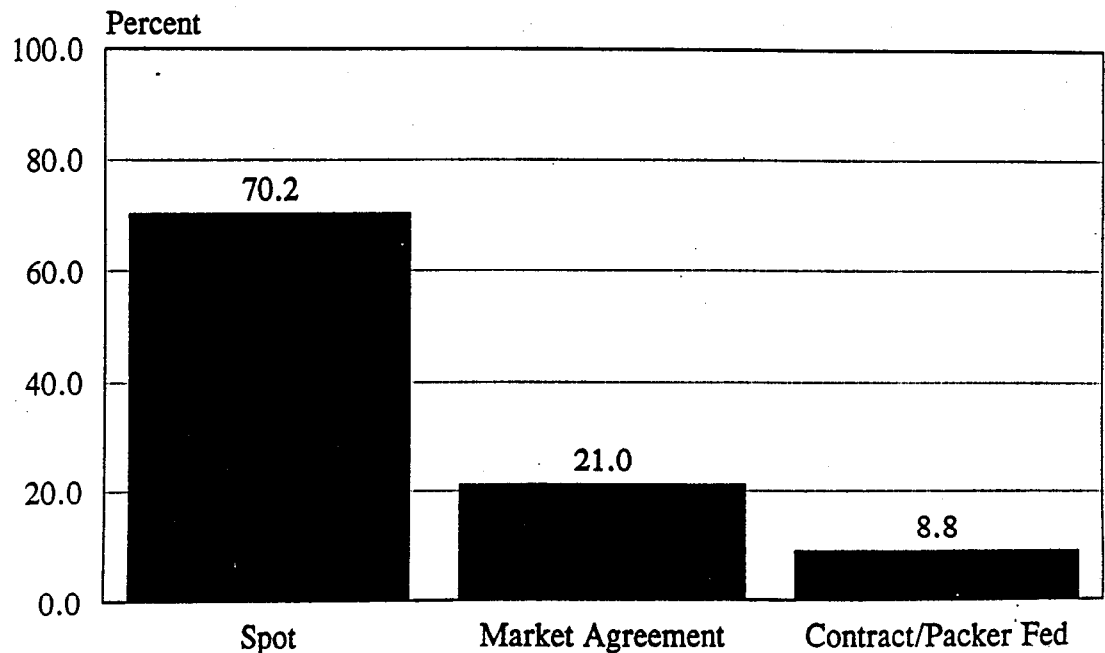
Average Number of Head
Spot Purchases by Weekday

Number of Head (thousands)

Day	Number of Head (thousands)
Monday	3.7
Tuesday	15.0
Wednesday	22.3
Thursday	15.6
Friday	6.3

Average Spot and Non-Spot
By Day of Slaughter

Head (thousands)

Day	Average Number of Head, Spot	Average Number of Head, Non-Spot
Monday	12.4	4.3
Tuesday	13.0	4.0
Wednesday	12.4	4.1
Thursday	11.1	5.7
Friday	10.4	6.4
Saturday	7.0	3.7

■ Average Number of Head, Spot ■ Average Number of Head, Non-Spot

Procurement Method by Week

Number of Head (Thousands)

05-Feb-95   14-May-95   20-Aug-95   26-Nov-95   03-Mar-96
26-Mar-95   02-Jul-95   08-Oct-95   14-Jan-96   21-Apr-96

━ Non-Spot Head ━ Total Head
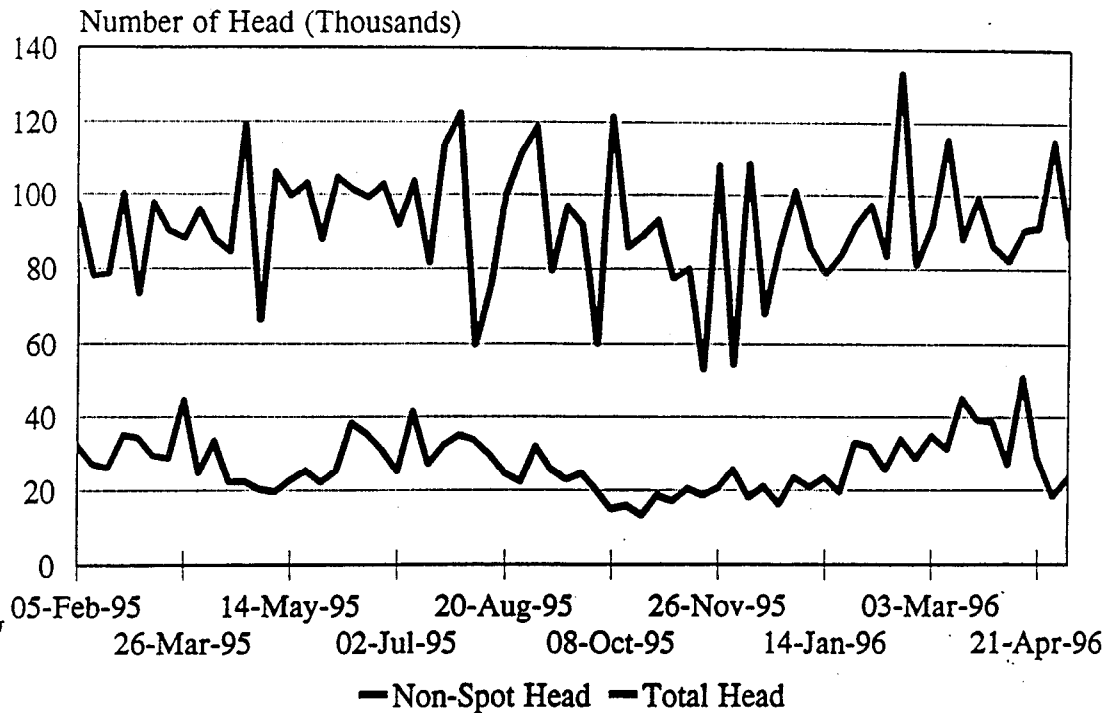
Overall Running Inventory

Number of Head (thousands)

06-Feb-95   11-May-95   14-Aug-95   17-Nov-95   27-Feb-96
25-Mar-95   27-Jun-95   30-Sep-95   10-Jan-96   13-Apr-96

━ Total Inventory ━ Non-Spot Inventory
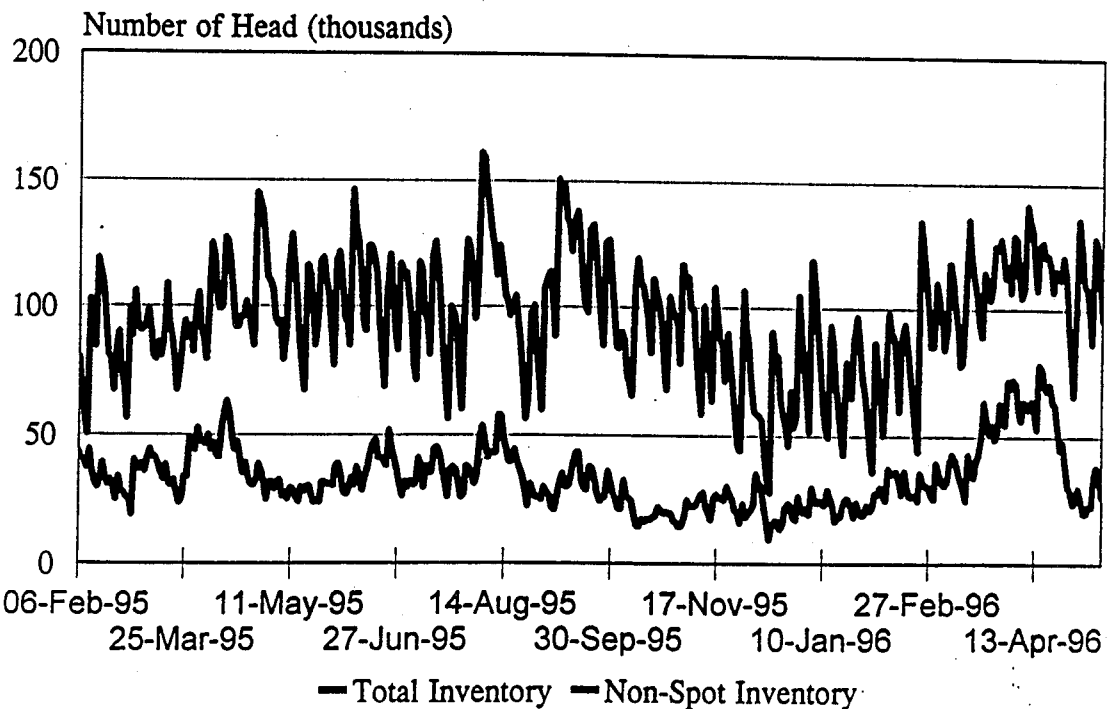
Avg.days of total inventory = 6.1   Avg. days of non-spot inventory = 1.9

FIGURE 1

Number of Spot Market Steers
Above the Reported AMS Daily High Steer Price

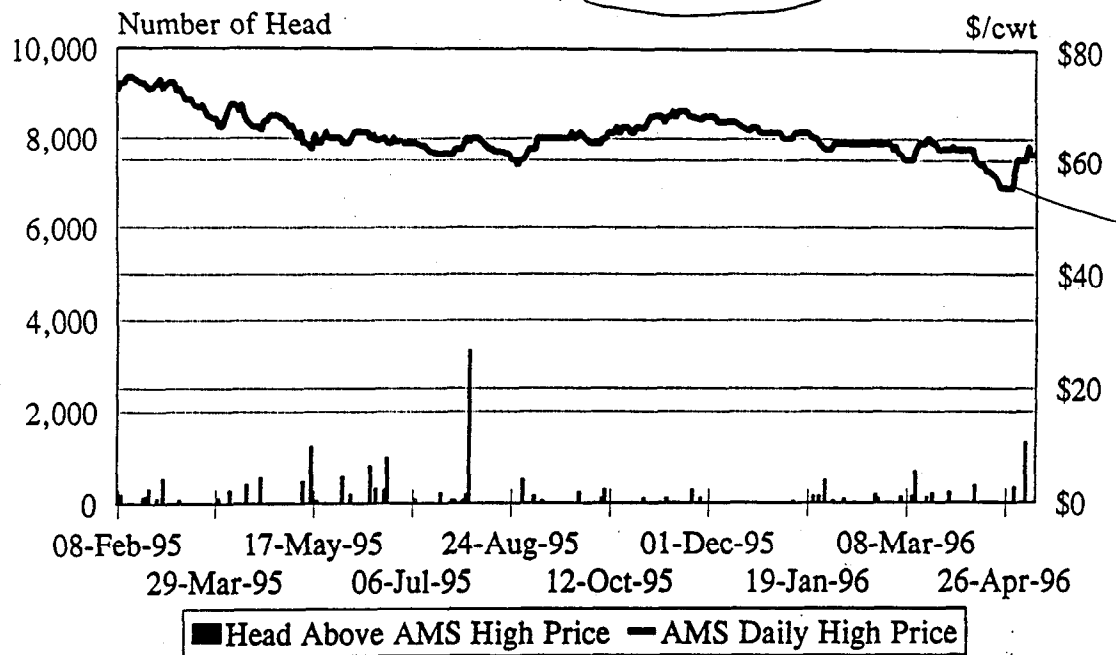Number of Head $/cwt
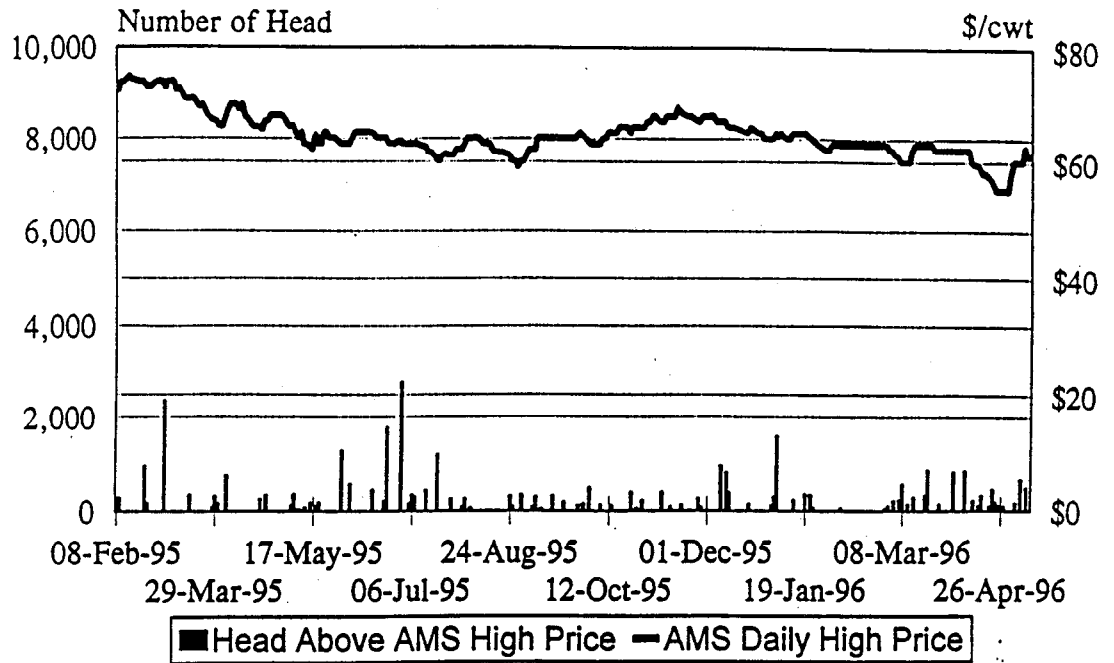
FOB Feedyard for SE/CH 35-65% and AMS SE/CH 35-65%, Amarillo, TX   91 days

Number of Spot Market Steers
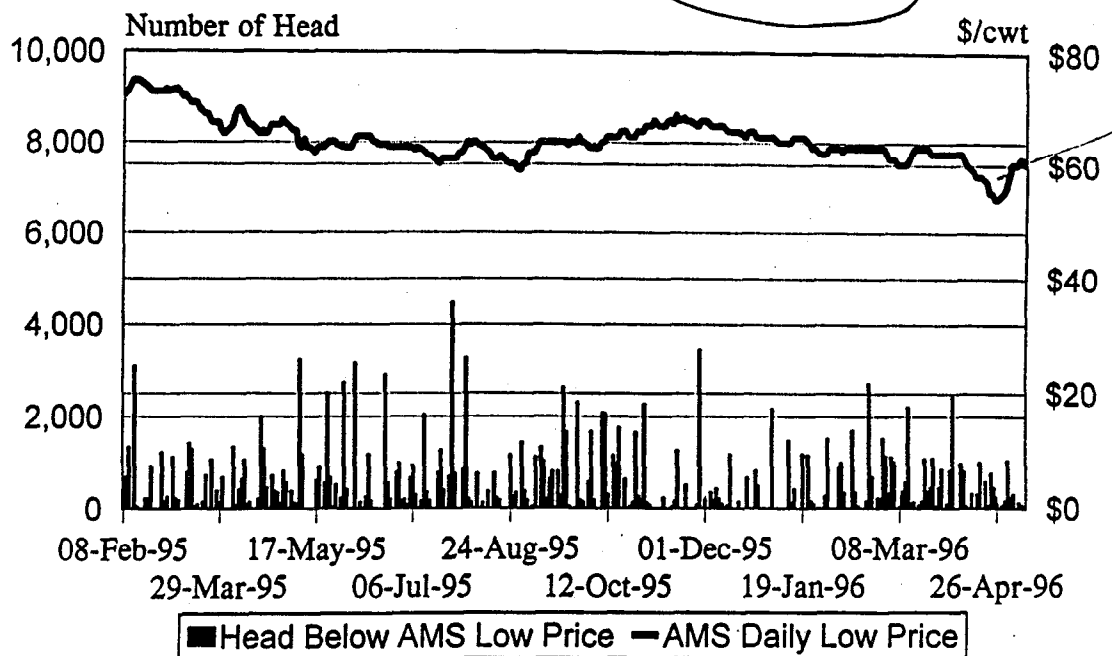# Below the Reported AMS Daily Low Steer Price

Number of Head $/cwt
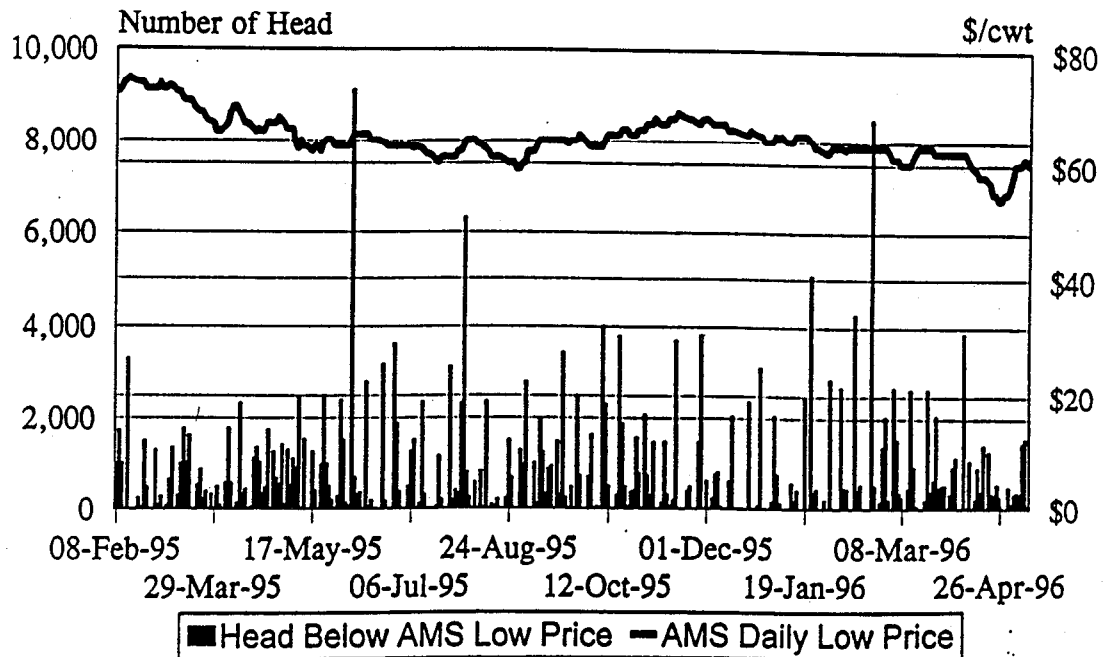
FOB Feedyard for SE/CH 35-65% and AMS SE/CH 35-65%, Amarillo, TX   219 days

Number of Spot Market Heifers
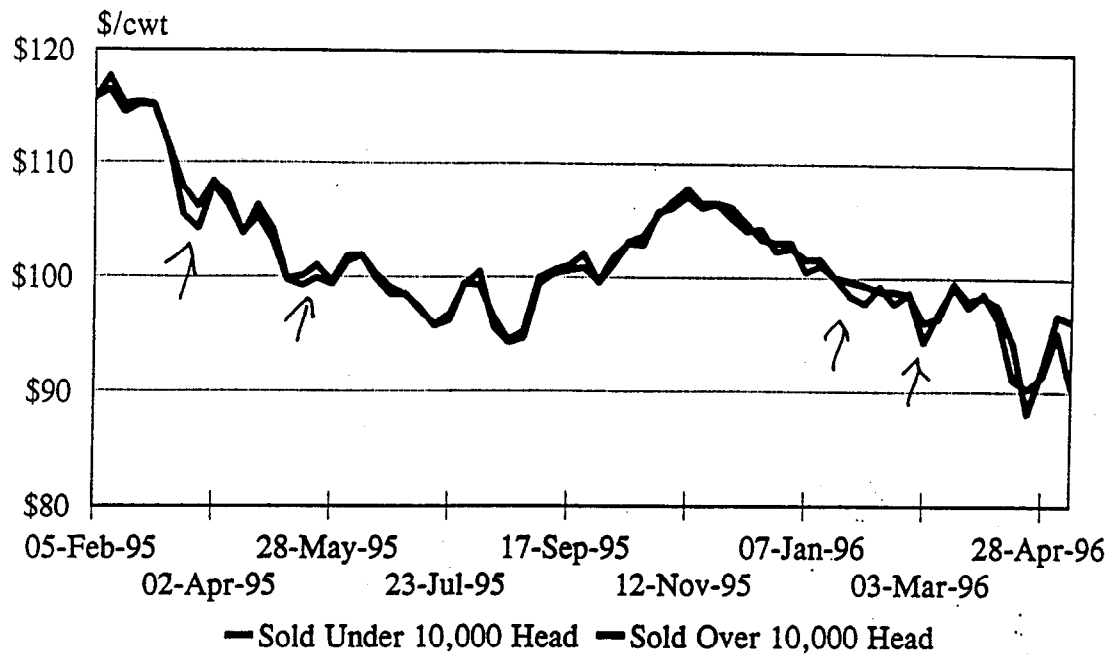## Above the Reported AMS Daily High Heifer Price

FOB Feedyard for SE/CH 35-65% and AMS SE/CH 35-65%, Amarillo, TX   54 days

Number of Spot Market Heifers
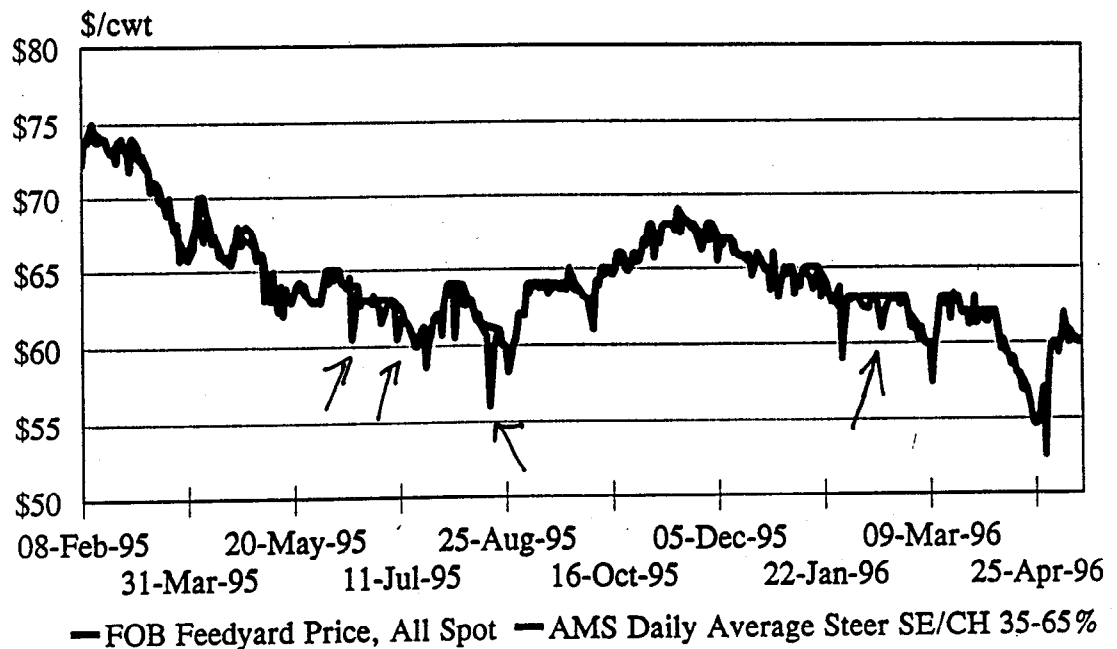## Below the Reported AMS Daily Low Price

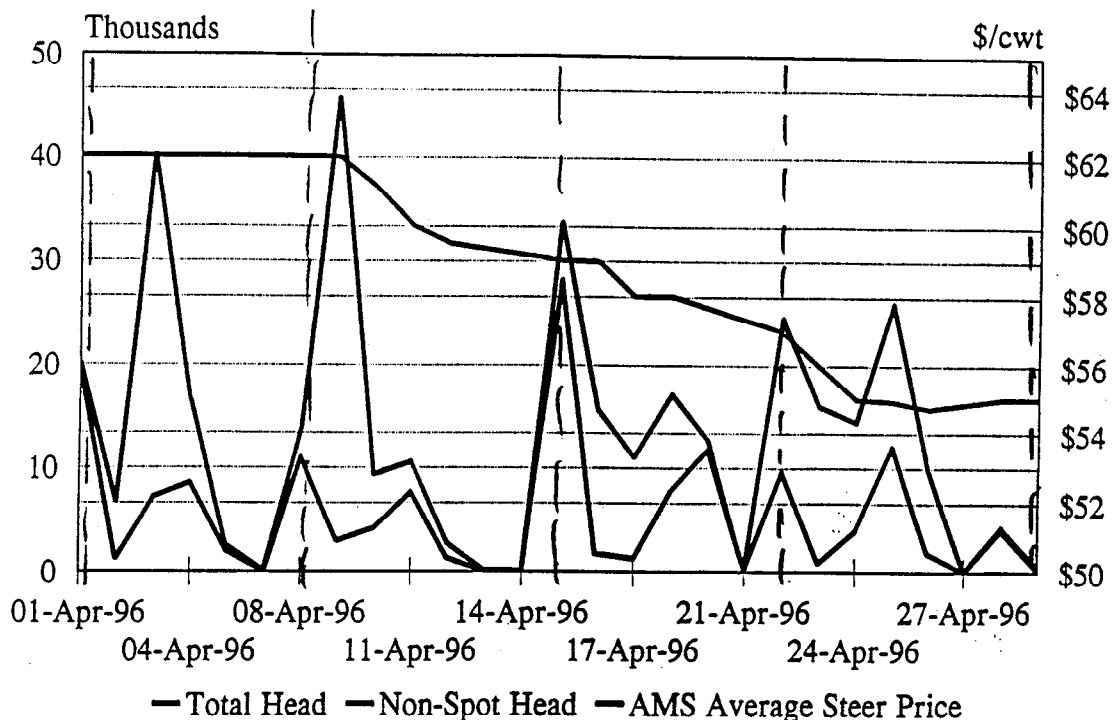FOB Feedyard for SE/CH 35-65% and AMS SE/CH 35-65%, Amarillo, TX 213 days

Average Hot Cost by Seller Size
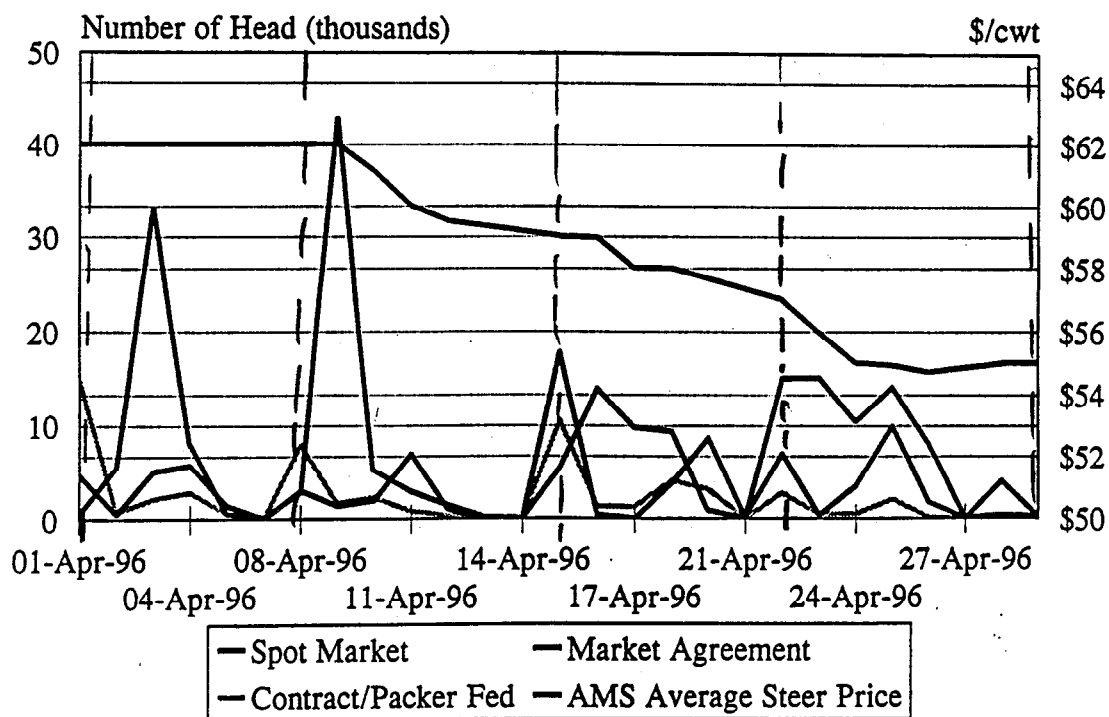## (By Purchase Week)

$/cwt

$120	
$110	
$100	
$90	
$80	

05-Feb-95   28-May-95   17-Sep-95   07-Jan-96   28-Apr-96
       02-Apr-95   23-Jul-95   12-Nov-95   03-Mar-96

— Sold Under 10,000 Head — Sold Over 10,000 Head

Average Live Prices

$/cwt

$80	
$75	
$70	
$65	
$60	
$55	
$50	

08-Feb-95   20-May-95   25-Aug-95   05-Dec-95   09-Mar-96
       31-Mar-95   11-Jul-95   16-Oct-95   22-Jan-96   25-Apr-96

— FOB Feedyard Price, All Spot — AMS Daily Average Steer SE/CH 35-65%

FIGURE 7

Non-Spot Head, Total Head and AMS Price
April 1, 1996 to April 30, 1996

Total Head — Non-Spot Head — AMS Average Steer Price

Spot, Non-Spot Transactions and AMS Price
April 1, 1996 to April 30, 1996

— Spot Market — Market Agreement
— Contract/Packer Fed — AMS Average Steer Price

FIGURE 8

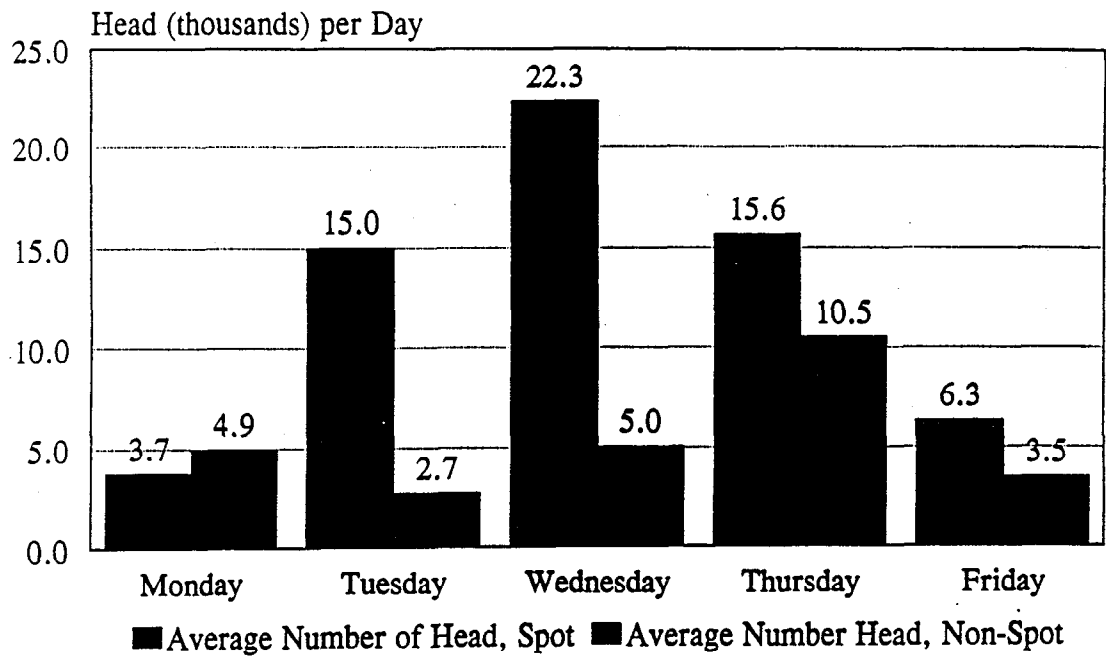# Type of Cattle Purchased
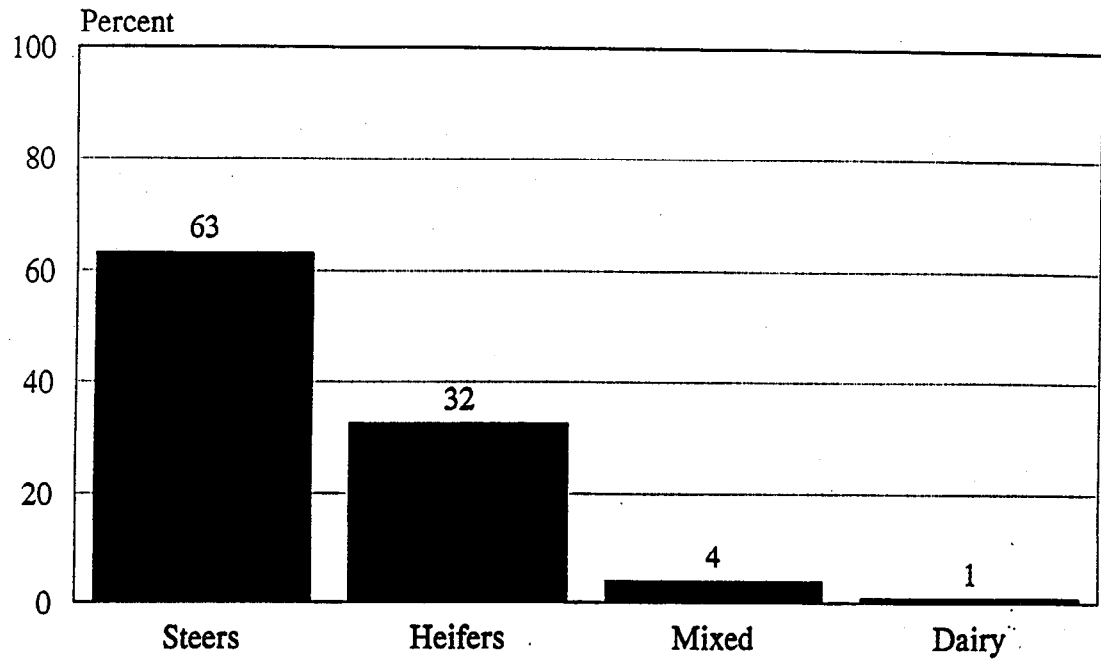
Average Lot Performance Characteristics
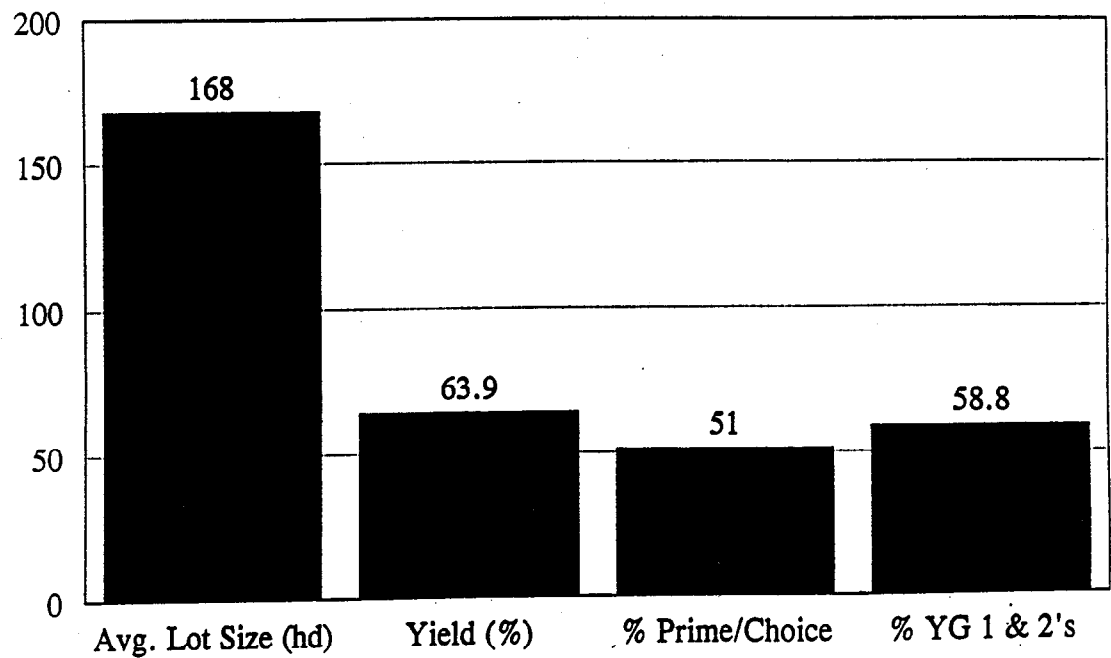
Average Spot and Non-Spot Purchases by Weekday

Head (thousands) per Day

	Monday	Tuesday	Wednesday	Thursday	Friday
Average Number of Head, Spot	3.7	15.0	22.3	15.6	6.3
Average Number Head, Non-Spot	4.9	2.7	5.0	10.5	3.5

■ Average Number of Head, Spot   ■ Average Number Head, Non-Spot

Number of Days Between Purchase and Slaughter

Percent of Head

Days	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Percent	0.1	1.7	4.4	4.9	6.4	10.8	16.8	22.4	13.8	7	4	2.7	1.8	1.4	1.1

Days Between Purchase and Slaughter
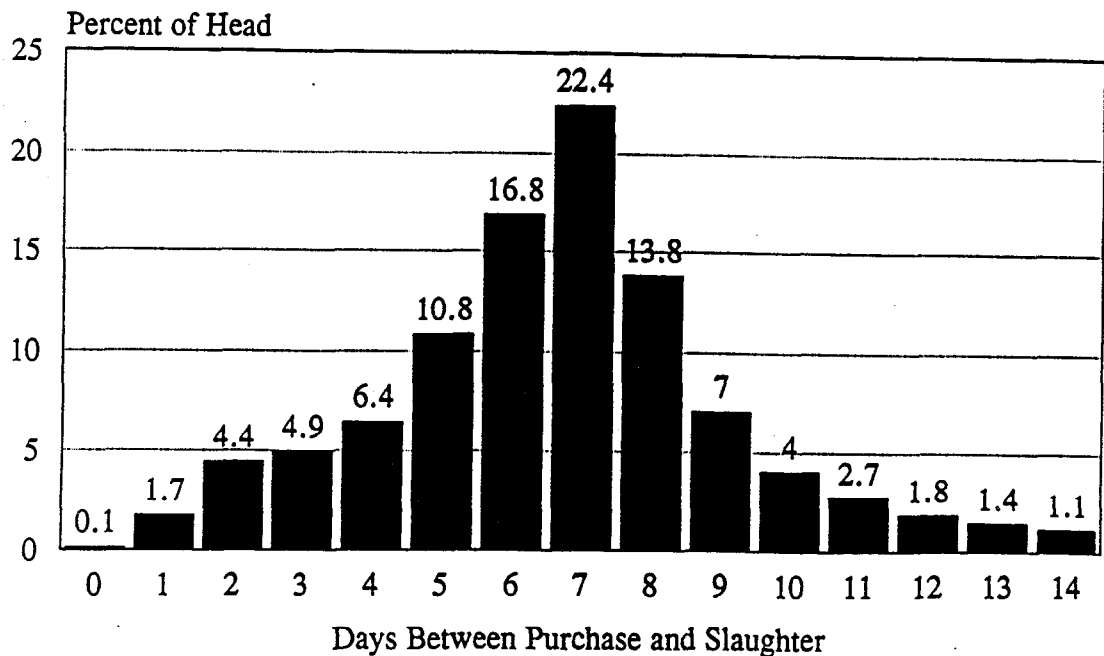
Spot Market Purchases Only

67% purchased within 7 days
32% purchased 8-14 days .